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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/680,229	10/08/2003	Kui Yao	4249-0112P	5826

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EXAMINER	
TALBOT, BRIAN K	

ART UNIT	PAPER NUMBER
1762	

NOTIFICATION DATE	DELIVERY MODE
05/08/2007	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

mailroom@bskb.com

Office Action Summary	Application No.	Applicant(s)	
	10/680,229	YAO ET AL.	
	Examiner	Art Unit	
	Brian K. Talbot	1762	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 February 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-38* is/are pending in the application.

4a) Of the above claim(s) *37 and 38* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-36* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *08 October 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *1/8/04 and 1/3/06*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

1. Applicant's election with traverse of Group I, claims 1-36, in the reply filed on 2/16/07 is acknowledged. The traversal is on the ground(s) that there is no serious burden to examine all the claims in a single application. This is not found persuasive because the issues that arise in prosecuting process and product claims are diverse and this would constitute a burden on the Office.

The requirement is still deemed proper and is therefore made FINAL.

2. Hence, claims 1-38 remain in the application with claims 37-38 being directed toward a non-elected invention. Claims 37 and 38 should be canceled in response to this Office Action. Claims 1-36 remain active in the application.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-36 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The term "low-melting point" in claim 1 is a relative term which renders the claim indefinite. The term "low-melting point " is not defined by the claim, the specification does not

provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

The term "elevated" in claims 4,16 and 35 is a relative term which renders the claim indefinite. The term "elevated" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

Regarding claims 18,20 and 23, the claims appear no to be further limiting as the limitation are found in independent claim 1.

Regarding claims 21 and 22, the term "ESL" is unclear. In addition, Applicant is reminded that Trademarks are not allowed in the claims.

Regarding claim 28, the term 'the drying temperature" is unclear as to which or both drying temperatures are being referred to as there are more than one drying steps performed.

Regarding claim 35, the term "the layered substrate" is unclear. The term "layered substrate is referred to as the substrate and the piezoelectric film whereas in this case it appears that the "layered substrate" is being referred to the substrate having the piezoelectric film and the electrode. Clarification is requested.

Regarding claim 36, the claim is unclear as it is not understood whether all the limitations recited in the Figure and Examples is part of the claimed subject matter. The Examiner suggests reciting what limitations are relied upon for proper claim language to overcome this rejection or to cancel the claim. In addition, the preceeding claims 1-35 already describe the invention and it is unclear whether this claim would be further limiting or duplicate of any one of the preceeding claims.

Regarding claims 2,3,5-15,17,19,24-27 and 29-34, the claims are rejected as being dependent upon a rejected base claim.

Claim Rejections - 35 USC § 103

4. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-4,11-14,16-21,23-26,28-31,33-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over GB 2161647 in combination with Sandhage (5,318,725) further in combination with Fernandez et al. "Processing and microstructure of porous and dense PZT thick films on Al_2O_3".

GB 2161647 teaches a piezoelectric device whereby a piezoelectric layer is formed from a composition including piezoelectric powder and a glass–like binding agent. The piezoelectric material is PZT while the binding agent is lead borosilicate. A liquid carrier is utilized to form a paste for screen printing the piezoelectric material to form a film (abstract). After screen printing, the piezoelectric layer is fired by heating to form the layer. The thickness can be from 10-100 microns. The grain size of the powder is 5-10 microns or less. The liquid carrier is ethyl cellulose and terpineol. Electrodes can be applied by a printing process to the PZT film and include silver (pg. 1, line 95 – pg. 4, line 20).

GB 2161647 fails to teach the liquid phase precursor of metal oxide for the binding agent.

Sandhage (5,318,725) teaches electroceramics and process for making the same. The ceramic material is a PZT (abstract). The liquid-phase sintering aids include B2O3, PbO, etc (col. 3, lines 1-5).

Therefore it would have been obvious for one skilled in the art at the time the invention was made to have modified GB 2161647 PZT process by incorporating the "binding agent" in liquid form as evidenced by Sandhage (5,318,725) with the expectation of achieving similar success.

GB 2161647 in combination with Sandhage (5,318,725) fail to teach milling the PZT powder and carrier to form a paste.

Fernandez et al. "Processing and microstructure of porous and dense PZT thick films on Al_2O_3" teaches PZT films by taking ceramic powders and organic carrier (terpeinol and ethyl cellulose) and milling to form a paste to be screen printed (pg. 5400, col. 2).

Therefore it would have been obvious for one skilled in the art at the time the invention was made to have modified GB 2161647 in combination with Sandhage (5,318,725) PZT process by incorporating a milling step to form the paste as evidenced by Fernandez et al. "Processing and microstructure of porous and dense PZT thick films on Al_2O_3" with the expectation of achieving similar success.

Claims 5-10 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over GB 2161647 in combination with Sandhage (5,318,725) further in combination with Fernandez et al. "Processing and microstructure of porous and dense PZT thick films on Al_2O_3" further in combination with either Akiyama et al., "Development of lead zirconate titanate family thick films on various substrates" or Thiele et al. "Processing and properties of screen-printed lead zirconate titanate piezoelectric thick films on electroded silicon".

GB 2161647 in combination with Sandhage (5,318,725) further in combination with Fernandez et al. "Processing and microstructure of porous and dense PZT thick films on Al_2O_3" fails to teach the "binding agent", i.e. sintering aids being LiO_2 and B_2O_3 and combination thereof.

Akiyama et al., "Development of lead zirconate titanate family thick films on various substrates" or Thiele et al. "Processing and properties of screen-printed lead zirconate titanate piezoelectric thick films on electroded silicon" both teach using sintering aids for PZT formation including LiO_2 and B_2O_3 and combination thereof (abstract and pg. 5524/ pg. 2863) respectively.

Therefore it would have been obvious at the time the invention was made to have modified GB 2161647 in combination with Sandhage (5,318,725) further in combination with

Fernandez et al. "Processing and microstructure of porous and dense PZT thick films on Al_2O_3" process by utilizing sintering aids for PZT formation including LiO_2 and B_2O_3 and combination thereof as evidenced by Akiyama et al., "Development of lead zirconate titanate family thick films on various substrates" or Thiele et al. "Processing and properties of screen-printed lead zirconate titanate piezoelectric thick films on electroded silicon" with the expectation of achieving similar success.

Regarding claims 7-10 and 15, the claims recite particular compounds for the "binding agent", i.e. sintering aids being LiO_2 and B_2O_3 and combination thereof. While the Examiner acknowledges the fact that the references relied upon fail to specifically recite the claimed compounds, it is the Examiner's position that one skilled in the art at the time the invention was made would have had a reasonable expectation of achieving similar success regardless of the particular compounds utilized to include LiO_2 and B_2O_3. If Applicant disagrees, Applicant is invited to supply a showing of unexpected results regarding the material compound utilized to introduce LiO_2 and B_2O_3 versus those utilized by the prior art. Applicant is reminded upon such a showing that all claims be amended to include such a limitation so as to be commensurate in scope with the showing.

Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over GB 2161647 in combination with Sandhage (5,318,725) further in combination with Fernandez et al. "Processing and microstructure of porous and dense PZT thick films on Al_2O_3" further in combination with Maas et al. "Thick-film printing of PZT onto silicon".

GB 2161647 in combination with Sandhage (5,318,725) further in combination with Fernandez et al. "Processing and microstructure of porous and dense PZT thick films on Al_2O_3" fails to teach the claimed organic carrier ESL 400.

Maas et al. "Thick-film printing of PZT onto silicon" teaches incorporating a organic binder vehicle of ESL 400 to a powdered PZT to form a PZT paste for thick-film printing (pg. 109).

Therefore it would have been obvious for one skilled in the art at the time the invention was made to have modified GB 2161647 in combination with Sandhage (5,318,725) further in combination with Fernandez et al. "Processing and microstructure of porous and dense PZT thick films on Al_2O_3" by incorporating a organic vehicle of ESL 400 as evidenced by Maas et al. "Thick-film printing of PZT onto silicon" with the expectation of achieving similar success.

Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over GB 2161647 in combination with Sandhage (5,318,725) further in combination with Fernandez et al. "Processing and microstructure of porous and dense PZT thick films on Al_2O_3" further in combination with Yao et al. "Improved preparation procedure and properties for a multilayer piezoelectric thick-film actuator".

GB 2161647 in combination with Sandhage (5,318,725) further in combination with Fernandez et al. "Processing and microstructure of porous and dense PZT thick films on Al_2O_3" fails to teach the claimed isostatic pressing step.

Yao et al. "Improved preparation procedure and properties for a multilayer piezoelectric thick-film actuator" teaches incorporating a high isostatic pressure step on a green PZT film before firing and bonding to an electrode (abstract).

Therefore it would have been obvious for one skilled in the art at the time the invention was made to have modified GB 2161647 in combination with Sandhage (5,318,725) further in combination with Fernandez et al. "Processing and microstructure of porous and dense PZT thick films on Al_2O_3" process by incorporating a high isostatic pressing step as evidenced by Yao et al. "Improved preparation procedure and properties for a multilayer piezoelectric thick-film actuator" because of the improved material density and bonding strength resulting from the pressing step.

Claim 32 is rejected under 35 U.S.C. 103(a) as being unpatentable over GB 2161647 in combination with Sandhage (5,318,725) further in combination with Fernandez et al. "Processing and microstructure of porous and dense PZT thick films on Al_2O_3" further in combination with Chen et al. "Dielectric, ferroelectric and piezoelectric properties of lead zirconate titanate thick films on silicon substrates".

GB 2161647 in combination with Sandhage (5,318,725) further in combination with Fernandez et al. "Processing and microstructure of porous and dense PZT thick films on Al_2O_3" fails to teach the claimed platinum substrate.

Chen et al. "Dielectric, ferroelectric and piezoelectric properties of lead zirconate titanate thick films on silicon substrates" teaches forming PZT films on platinum buffered silicon substrates (abstract).

Therefore it would have been obvious for one skilled in the art at the time the invention was made to have modified over GB 2161647 in combination with Sandhage (5,318,725) further in combination with Fernandez et al. "Processing and microstructure of porous and dense PZT thick films on Al_2O_3" by utilizing a platinum buffered substrate as evidenced by Chen et al. "Dielectric, ferroelectric and piezoelectric properties of lead zirconate titanate thick films on silicon substrates" with the expectation of achieving similar success.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brian K. Talbot whose telephone number is (571) 272-1428. The examiner can normally be reached on Monday-Friday 8AM-4PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy H. Meeks can be reached on (571) 272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

B K Talbot 4/25/07

Brian K Talbot
Primary Examiner
Art Unit 1762

BKT